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STUDY ON PEDIATRIC OCULAR TRAUMA

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CERTIFICATE

Certified that this dissertation entitled **" STUDY ON PEDIATRIC OCULAR TRAUMA**" is the bonafide work done by Dr. P.Kannan , Post Graduate Student, done under my guidance and supervision during the period June 2004 to February 2007 in partial fulfillment of the requirement for the award of M.S. degree (Ophthalmology) of the Tamil Nadu Dr. M.G.R. Medical University.

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DECLARATION

I solemnly declare that this dissertation on " **Study on Pediatric Ocular Trauma**" was done by me at Regional Institute of Ophthalmology, Government Ophthalmic Hospital, Madras Medical College, Chennai under the guidance and supervision of **Prof. P. Sudhakar M.S.,D.O.,.**

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STUDY ON PEDIATRIC OCULAR TRAUMA

INTRODUCTION

"Pediatric ocular trauma is trauma for ever" holds right. Ocular trauma mostly always has consequences which need periodic follow up.

Pediatric ocular trauma differs from adult in

- Generally, late onset of presentation to hospital
- Difficulty in examination
- Necessity of frequent GA and repeated surgical procedures
- Difficulty in postoperative care and needs parents education
- Possibility of amblyopia and other complications.

Classification

Ocular injuries can be anatomically classified as intraocular injuries and extraocular injuries.

Extraocular injuries are lid lacerations, orbital fractures, orbital hemorrhage, traumatic optic neuropathy etc.

Ocular Trauma classification group has classified intraocular mechanical injuries into closed globe and open globe injuries.

This classification is based on the following variables

TYPE OF INJURY:

Closed globe injuries:

Ocular injury without full thickness defect of the coats. They are contusion, lamellar laceration (partial thickness injury of the coats).

Open globe injuries:

Full thickness defects in the corneoscleral coat of the eye. They are laceration – full thickness outside to inside break in ocular coat (can be penetrating injury if the object traverses the coats only once or perforating injury if both an entry and exit wounds are present) and rupture- full thickness inside to outside break in the ocular coats.

2. **Grade of injury** (based on the visual acuity of the involved eye at the time of presentation)

Grade 1: greater or equal to 20/40

Grade 2: 20/50 to 20/100.

Grade 3: 19/100 to 5/200

Grade 4 : 4/200 to light perception.

Grade 5 **:** no light perception.

3. **Presence or absence of relative afferent pupillary defect**.

4. **Zone of injury**- based on the location.

For open globe injury

zone 1: isolated to the cornea

zone 2: limbus to a point 5mm posterior into sclera

zone 3: posterior to the anterior 5 mm of sclera.

In closed globe injury

zone 1: external (limited to bulbar conjunctiva, sclera and cornea)

zone 2: anterior segment(including posterior lens capsule and pars plicata)

zone 3: posterior segment (all internal structures posterior to the posterior lens capsule).

EVALUATION OF PATIENT WITH OCULAR TRAUMA

Initial evaluation is important because it is at this time physician is able to observe damage to such structures as retina and optic nerve that may later be obscured by continued hemorrhage or cataract formation.

Goals for initial evaluation can be organized on 4 levels:

A.Recognition of emergency conditions

1. Life threatening injuries:

eg. Cardiovascular compromise, massive bleeding, major trauma to organ system.

2. Emergency ocular conditions: eg. Chemical injuries.

3. Recognition of complete extent of ocular involvement.

B. Identification of confounding factors:

1. Other associated non life threatening injuries

2. Concurrent medical conditions eg. bleeding disorders,

Hepatitis B.

C. Need for further testing:

Radiological, ultrasonological etc.

D. Development of initial treatment plan.

History :

Complete description of events surrounding the injury should be elicited from patient /parents/ witness.

Past History:

Any preexisting ophthalmic disease, previous ophthalmic surgery, the best preinjury visual acuity should be established and specific questions should be asked about the presence of amblyopia. Patient's tetanus immunization status should be ascertained. Any drug allergies should be recorded.

Specific history:

In chemical injuries following the institution of emergency treatment, detailed history should be obtained regarding the nature of chemical, amount of material in contact with eye, duration of contact and physical character of the material(fluid, gel, past, particulate).

When foreign bodies are suspected or present, four major questions should be asked- nature of the foreign body material, its origin, its possible trajectory and the risk of microbial contamination.

In case of blunt trauma, questions should be directed toward determining amount of energy transferred to the globe and orbit, physical characteristics of the object.

Examination :

All associated injuries to face, head and neck should be inspected and drawn in the record. In case of lid lacerations one should carefully note for canalicular involvement. Orbital rim should be palpated for rim fractures.

Check the extraocular movements.

Conjunctiva should be examined carefully. Areas of subconjunctival hemorrhage or abnormal pigmentation of the bulbar conjunctiva may indicate globe rupture. Lid should be everted for foreign bodies and particulate matter.

Examine Cornea- for erosions, partial/full thickness tear, Bowman's/ Descemet's membrane tear and in case of penetrating injury wound of entry. Examine anterior chamber depth and for the presence of hyphema. In Iris, see for iris hole, foreign body embedded in iris, sphincter tears. Pupils for size, iris peaking may provide information on occult scleral injury. Pupil reaction and for the presence of RAPD. Examine the lens for lens opacities. Detailed fundus examination after dilatation.

Slit lamp examination in a step- by- step manner from lid margins to the palpebral, bulbar and tarsal conjunctiva, followed by the cornea, anterior chamber, iris, lens and vitreous.

Measure V/A in each eye. If rupture globe is suspected, no diagnostic maneuvers that may further damage the eye should be attempted.

DIAGNOSTIC IMAGING OF OCULAR AND ORBITAL TRAUMA

They are indispensable when the media are opaque or when the damage to the periorbital region or the presence of foreign body is suspected. Primary radiological methods in evaluating trauma are plain film radiography, CT, MRI and ultrasound.

Plain film radiography:

They have advantage in depicting the shape and number of metallic foreign bodies and locating orbital wall fractures.

Specific plain film series include use of Caldwell's projection, water's projection and lateral view.

Water's projection is useful for evaluating orbital floor and blow out fractures. Caldwell's view is useful for medial orbital wall, lateral and superior orbital rims.

Basic questions to be answered are

1. Is the foreign body inside or outside the globe.

2. what is the proximity of the foreign body to the sclera.

Elaborate multiview localization schemes using radio opaque markers have been developed. They include

a. Wessely Comberg Pfeiffer procedure -which use contact lens with radio opaque markers in the four quadrants and an elaborate charting system.

b. Sweet's triangulation methods

c. Limbal ring devices

d. Sub tenon injection of air or contrast media.

One drawback of all these methods has been the error induced by the assumption of a 24 mm axial length for the geometric mapping.

Another technique is bone free or soft tissue localization using dental film and softer x- rays to localize nonmetallic foreign bodies in the anterior segment.

Computed tomography :

Standard diagnostic test for imaging the traumatized eye and orbit. Tomographic sections in axial, coronal and sagittal planes at the level of the eye and orbit provide an accurate anatomic view of soft tissue and bony

changes. Can detect metallic foreign bodies less than 1mm in size except for aluminum and less radio opaque objects of slightly larger size. Always insist on the thinnest possible slices(less than or equal to 1.5mm) through the orbits and in the case of suspected small foreign body requesting overlapping slices.

Magnetic resonance imaging:

May be used for nonmetallic foreign body localization and ocular soft tissue and orbital imaging. The potential for tissue damage from movement of ferromagnetic foreign body in the intense field of the magnet precludes use of MRI as a scanning technique although some investigators have shown in experimental system that only large volume ferrous foreign bodies move in the magnetic field.

Ultrasound:

Two techniques:

Immersion technique using water bath &Contact technique- has advantage of simplicity but does not permit optimal depiction of lens and anterior chamber.

Ocular ultrasound is generally performed at frequencies of 8-10 MHz. For orbital inflammation or in the presence of much blood, use of low frequencies ultrasound, 5 MHz may be in order to allow sufficient sensitivity for good visualization.

ANTERIOR SEGMENT TRAUMA

Management of corneoscleral lacerations

Primary objective for penetrating corneoscleral injuries is complete, watertight closure of the globe with restoration of structural integrity.

Secondary goals include removal of disrupted lens, vitreous, avoidance of uveal & vitreous incarceration in the wound, removal of intraocular foreign body and restoration of normal anatomic relationships with minimal tissue distortion.

Nonpenetrating corneal lacerations:

Siedel's test with 2% fluorescein should be performed to check for microscopic leaks.

If the edges are not overriding and there is no significant wound gape, pressure patching with antibiotic ointment may be sufficient to promote reepitheliazation and subsequent repair.

If the wound is somewhat unstable, bandage soft contact lens may be used to support the wound by its splinting effect and to enhance reepitheliazaton by shielding the cornea from lid movement. The lens should

remain in place until the stromal wound has become relatively stabilized (3-6 weeks) and epitheliazation is complete.

Occasionally a flap of tissue will be avulsed from the cornea remaining attached at its base. Although bandage contact lens may stabilize the tissue in its proper position, in some cases sutures may be necessary to ensure good reapproximation.

Simple full thickness corneal lacerations:

Defined as one that does not violate the limbus and has neither iris, lens or vitreous incarceration nor traumatic lens damage.

Bandage soft lens: often useful for nondisplaced, beveled or edematous lacerations <3 mm in length. In cases that respond satisfactorily, the lens should be in place until the wound has stabilized (usually 3-6 weeks).

Cyanoacrylate tissue adhesive: is useful either alone or adjunctive treatment for puncture wounds with small amounts of central tissue loss, stellate wounds with poor central apposition, selected small (<2mm) lacerations that do not self seal and those would require excessive suture placement in the visual axis.

Corneal suturing:

In children who are at greatest risk of inadvertently rubbing the eye with consequent reopening the eye managed with tissue adhesive or contact lens supported wound, prompt wound closure is needed.

Large lacerations (>3mm), displaced wounds, wounds with loss of corneal tissue, lacerations with accompanying iris or lens incarceration.

If initial placement of deep, definitive sutures should cause loss of AC, it is useful to place temporary sutures first. Monofilament 10 0 nylon suture on a fine spatula design microsurgical needle is used for corneal suturing. Some surgeons prefer even finer 11 0 sutures for work near the visual axis.

The definitive suture should be approximately 1.5mm long, 90 % deep in the stroma and of equal depth on both sides of the wound. Suture bites through the visual axis should be avoided.

A locked 2-1-1 knot or 1-1-1 slip knot may facilitate subsequent suture removal compared to standard surgeon 3-1-1 knot. To minimize scarring all knots should be trimmed short and superficially buried on the side away from the visual axis. After repair, AC may be deepened through either paracentesis or wound itself. Then the wound should be checked for leak by gentle pressure.

Corneal laceration with iris incarceration:

During acute repair of the corneal laceration, the initial sutures should avoid the incarcerated iris if such areas exist. An exquisitely fine sharp needle is required for the initial sutures so that the wound does not separate when the suture is passed. Once the wound is stabilized, the most atraumatic method of repositioning the incarcerated iris is with viscoelastic material injected either through the wound or obliquely to deepen the chamber and draw the iris away from the cornea.

Frankly prolapsed, exposed iris must be evaluated thoroughly before deciding to either reposition or excise it. Most trauma surgeons would reposition a prolapsed iris that have been exposed only several hours and excise a severely macerated iris or one that has been prolapsed longer than 24 hours.

Corneal lacerations with lens involvement:

Decision about lens removal depends on critical preoperative and intraoperative assessment. If preoperative assessment is correct and surgical visualization adequate, it is better to complete all operative interventions at a single surgical session.

However, a fibrinous AC reaction and pupillary membrane may occasionally masquerade a flocculent cataract. Moreover, poor visualization

through an edematous cornea makes immediate lens intervention inadvisable. Waiting just few days often will allow the cornea to clear, fibrin to resorb and inflammation to ablate, optimizing subsequent lens removal.

When in doubt, the lens should be left undisturbed and if necessary removed in a second procedure.

If lens capsule is intact, standard cataract extraction techniques may be used. In cases with capsule rupture, significant vitreous involvement or lens dislocation, lensectomy techniques using microvitrectomy are advisable.

Simple corneoscleral lacerations:

Lacerations extending beyond the limbus & into the sclera should be explored to delineate their full extent. Fixation sutures of 6 0 silk may be placed at the limbus if needed, but only if they can be placed without further wound disruption and prolapse of intraocular contents.

At every stage care must be taken to prevent iatrogenic damage. If possible limbus is first reapproximated to restore correct anatomic relationships using nonabsorbable 8 0 nylon or silk sutures. Prolapsed iris is next repositioned and corneal wound closed. To progressively stabilize the wound and prevent uveal prolapse during fixation and exploration, it is helpful to place scleral suture as soon as new area of laceration is exposed.

For scleral suturing most surgeons prefer nonabsorbable suture as 8 0 nylon/silk or absorbable suture as polygalactin 7 0. The sclera surrounding the laceration as well as remote quadrants should be completely explored to rule out unsuspected injury. Occasionally lacerations extend quite far posteriorly. In those cases it is probably better to leave the most posterior extent of wound unsutured than to distort the globe with unwilling delivery of intraocular contents.

Corneoscleral lacerations with vitreous prolapse:

Vitreous prolapsing through scleral wound is secured and gently withdrawn with dry cellulose sponge and cut flush with sclera. If visualization is good, automated vitrectomy may be used to excise vitreous at the wound.

Tissue loss and stellate lacerations:

Paton's method for closing a corneal hole is by using corneal patch graft. The deep bites of recipient bed are placed at a depth of at least three quarters and then superficially through patch graft just beneath bowman membrane.

The suture is then repassed in the recipient bed at 95% depth and exits the corneal stroma.

Eisner's technique for closing stellate lacerations is using purse string suture when undue compression may be required to reconstitute the anterior chamber.

Corneal laceration repair- topographic considerations and suturing techniques:

Corneal incision routinely produce corneal flattening over the area of the incision because of wound gaping. Radial incision flattens the cornea along both the axis of incision and the axis 90 degrees away. Whereas circumferential incision flatten the cornea along the axis of incision and steepen the cornea 90 degrees away.

Suturing techniques:

Perpendicular incisions are closed first with interrupted sutures to allow for reformation of the anterior chamber. Peripheral compression sutures are then placed to compress and flatten the peripheral cornea while conversely steepening the central cornea. Finally appositional sutures are placed in the central cornea while observing the corneal reflex.

LENS INJURIES

Contusion cataract may occur as either early or late sequelae. Moreover, blunt nonperforating ocular trauma can partially or totally dislocate the lens.

In general, Cataract causing decreased visual acuity, lens induced glaucoma or inflammation or poor visualization of the injured posterior segment are indications for surgical intervention.

Treatment:

For cataract with intact posterior capsule, no displacement and no vitreous in anterior chamber- by anterior or limbal approach, cataract can be removed by an aspiration technique in young patients. In older patients, standard phacoemulsification or ECCE/ SICS may be preferred.

Lens dislocation into the AC: if lens is dislocated anteriorly, miotic drops are instilled to trap the lens in the anterior chamber. In young patients, can be surgically aspirated. If aspiration is not safe, a limbal incision is made through which lens can be extracted with irrigating vectis. An automated vitrectomy will be necessary if vitreous is present.

Pars plana/ posterior approach is indicated in traumatic cataract when posterior capsule is ruptured or when there is lens dislocation or subluxation with vitreous prolapse into the anterior chamber.

IOL

Use of anterior chamber lenses should probably be avoided since there is high probability of preexisting contusion damage to the angle and the patients are usually young.

Placement of PCIOL in the capsular bag may result in postoperative lens decentration if there is undetected zonular incompetence. Therefore sulcus fixation may be safest technique for lens fixation.

TRAUMATIC HYPHEMA

Grading

Microscopic- no layered blood. circulating RBCs only.

Grade 1: < 1/3rd

Grade 2: 1/3rd -1/2 of anterior chamber

Grade 3:1/2 – near total

Grade 4: total (eight ball)

Most hyphema results from tears in the anterior face of ciliary body with disruption of the major arterial circle and its branches , recurrent choroidal arteries or ciliary body veins.

Treatment :

Most authors have noted no significant difference in between moderate activity and strict bed rest, Bilateral or unilateral patching did not produce differences in clinical results.

Cyloplegics:

1% atropine had no beneficial effect on rebleeding, blood resorption or vision. However cycloplegics may enhance patient comfort in the setting of traumatic iritis and associated mydriatic effect often facilitates fundus examination.

Miotics are generally avoided because of their tendency to increase intraocular inflammation.

Steroids : Topical steroids are commonly used in the setting of hyphema to minimize discomfort related to traumatic iritis.

Systemic steroids have been advocated to reduce the rate of rebleeding but their efficacy has not been proved.

Antifibrinolytics: Tranexamic acid.

Indications for surgical intervention:

1. Uncontrolled IOP - IOP > 50 mm for 5 days/ >35 mm for 7 days to avoid optic nerve damage. Earlier intervention is indicated in patients with preexisting sickle disease or preexisting glaucomatous optic atrophy.

2. Early corneal blood staining : patients with total hyphema and IOP > 25 mm for 5 days should undergo surgery to prevent blood staining.

3. Prolonged clot duration: large clots that persists longer than 10 days may lead to peripheral anterior synechiae and further complications.

Surgical techniques:

1. Paracentesis and anterior chamber wash out: Techniques involving injection of air and wash out with fibrinolytic agents do not appear to be more efficacious than simple irrigation with balance salt irrigation.

2. Clot expression and limbal delivery.

3.Automated hyphemectomy.

TRAUMATIC GLAUCOMA

Disruption or tears into the ciliary body may occur in the entire circumference or in scattered areas. These tears associated with a type of secondary open angle glaucoma is known as angle recession glaucoma.

The tear which often occurs between circular and longitudinal muscle of ciliary body causes the band to enlarge as the iris root is displaced posteriorly.

The diagnosis of angle recession is made by gonioscopic examination. The normal ciliary body is generally even in width throughout its circumference and the two eyes are usually symmetric. Unevenness in the width of ciliary body band or band greater than one trabecular meshwork in width constitutes recession.

Bilateral simultaneous koeppe gonioscopy with two lens is an excellent way to detect these differences particularly if they are subtle. Tears of the angle are classified as shallow, moderate, or deep.

Almost all patients who develop hyphema following blunt injury have some degrees of either recession or direct trabecular meshwork damage . If hyphema clears without complication and pressure normalizes, the patient

should be examined gonioscopically approximately 6 weeks following initial injury. If more than 180 degrees of the angle is recessed, there is up to 8 % chance of subsequent development of chronic glaucoma.

Because of risk of development of late angle recession glaucoma, all patients who have had a hyphema or an angle recession should have IOP checked annually for life.

It appears that those eyes with less than 180 degrees of recession are unlikely to develop late glaucoma.

Patients with unilateral angle recession glaucoma may have an underlying predisposition to the development of bilateral open angle glaucoma. It is possible that trauma to angle merely accelerates the glaucoma development in the injured eye.

POSTERIOR SEGMENT TRAUMA

TRAUMATIC MACULOPATHIES

Commotio retinae (Berlin's edema):

Typically injury occurs opposite the site of direct impact. It may take several minutes or hours for the ophthalmoscopic features to be manifest. The lesion consists of geographic pattern of gray white cloudy opacification of the outer retina. The edema may be located in the macula, posterior pole or peripapillary region or involve more extensive peripheral areas of retina. If entire posterior pole is involved, a pseudo cherry spot may arise.

The retinal whitening gradually subsides within several weeks following the trauma. Generally speaking, prognosis for central vision is excellent but guarded, particularly if other injuries are present.

Choroidal rupture:

Direct choroidal rupture may occur at the site of contusive impact and tend to be anterior and oriented parallel to the ora. Indirect choroidal ruptures are located away from the site of blunt impact and tend to be posterior, crescent shaped and oriented to the optic disc.

Often the choroidal rupture itself is obscured by the overlying hemorrhage and serial examination are necessary to diagnose the presence and extent of choroidal rupture as the hemorrhage resolves.

Initial visual acuity depends on location of rupture with reference to fovea, accompanying intraocular hemorrhage and accompanying retinal edema. If rupture transects the fovea or extensive pigmentary changes result within posterior pole, central acuity will probably be permanently impaired. Patients should be reevaluated periodically for the development of secondary choroidal revascularization.

Traumatic macular hole

Pathogenic mechanisms for the production of full thickness hole following trauma includes- postcontusion necrosis of tissues, subfoveal hemorrhage and vitreous traction.

Macular hole and its localized detachment may remain stationary. Meticulous examination of the peripheral retina is required to rule out additional sites of pathology. Prophylactic laser photocoagulation to the margin of the hole may not be necessary in the vast majority of patients nor is there any evidence to suggest that this decrease the risk of progressive RD.

TRAUMATIC RETINAL TEARS AND DETACHMENT

Retinal tears resulting from trauma are usually the result of damage to retina at the vireous base. Vitreous base traction from blunt trauma most frequently creates retinal dialysis at the ora serrata.

The interval between ocular contusion and discovery of retinal tear and detachment varies. 10-20% of traumatic RD are detached within 24 hours of injury. 30-46% within 1 month. 50-60% within 8 months and 80-82% within 2 years.

Posterior segment IOFB(intraocular foreign body):

Most posterior segment foreign bodies are metal fragments. Metallic foreign bodies usually arise from hammering on a chisel or using machine tool. Ocular damage caused by an IOFB occurs by two mechanisms-

1. penetrating injury with its secondary complications
2. presence of IOFB itself can damage from microbial endophthalmitis, toxicity or other inflammatory reaction.

Chemical inert IOFB include gold, silver, platinum and tantalum and other matter as stone, glass, plastic, porcelain, rubber and powder from firearms. Reactive metallic foreign bodies can cause exclusive ocular damage known as metallosis bulbi.

Management:

In general, IOFB of reactive substances such as iron/copper are considered toxic and should be removed promptly. Vegetable IOFB present a high risk of microbial endophthalmitis and should be removed as soon as possible. A less emergent approach can be used for nonmetallic IOFB.

External magnets:

Direct approach: refers to application of the electric magnets over the sclera directly adjacent to the IOFB and is unsuitable if IOFB is located posteriorly.

Indirect approach: refers to application of the electromagnets above the pars plana at a distance from the IOFB. This is done when the IOFB is located in the vitreous, over the retina without evidence of retinal penetration or posteriorly when preretinal or intraretinal location is inaccessible to extraction through adjacent sclera.

Vitrectomy: is used in cases of nonmagnetic, large or subretinal IOFB, eyes with opaque media or more generally, whenever IOFB cannot be used by a magnet.

Treatment of retinal breaks:

In general anterior retinal breaks are treated by an external cryotherapy and supported by an external scleral buckle. Posterior retinal tears are usually treated with endolaser photocoagulation or endocryotherapy.

TRAUMATIC ENDOPHTHALMITIS

The incidence is 2.4 -8 %. In rural setting or in cases with retained foreign body it may be as high as 30 %.

The recognition of endophthalmitis following trauma may be obscured by the consequences of the trauma itself such as pain, swelling, redness, media opacity and loss of vision. These can mask the usually signs and symptoms difficult to distinguish from an appropriate inflammatory responses to the injury.

Clinical signs may include fever, proptosis, eyelid swelling and ecchymosis, elevated IOP, corneal edema, corneal ring abscess, decrease or absence of red reflex, anterior chamber reaction including flare, cells, fibrin, or frank hypopyon, vitreous puff balls and retinal periphlebitis. If the examination raises serious concerns that endophthalmitis is present, vitreous and aqueous samples must be obtained for culture before therapy.

Causative organisms for traumatic endophthalmitis are S.epidermidis, Bacillus sps., Streptococcus sps., Gram negative organisms, mixed flora, S. aureus, fungi and anaerobes in descending order.

Guidelines for the management of suspected traumatic endophthalmitis:

1. prompt collection of vitreous and aqueous specimens for culture, stain and smear.
2. Rule out IOFB by CT, X-ray and ultrasound.
3. systemic, periocular and topical antibiotic prophylaxis in all cases of open globe injuries.
4. intravitreal antibiotic therapy
5. vitrectomy when there is severe inflammation
6. consideration of intravitreal steroid therapy for cases with severe inflammation.
7. avoidance of repeat intravitreal injection except in cases with a positive repeat culture or smear.

Though prognosis has been greatly improved by recent refinements in diagnosis, intravitreal antibiotic therapy and vitreous surgery, the overall prognosis in traumatic endophthalmitis remains poor. The reasons for the poorer prognosis include associated damage to vital ocular structures, infection with organisms of greater virulence and delay in diagnosis and treatment.

ORBITAL AND ADNEXAL TRAUMA

BLUNT TRAUMA TO ORBITAL SOFT TISSUES

Contusion injuries

Result from crushing of subcutaneous muscle and connective tissues with secondary hemorrhage and edema. Infected tense or large hematomas of the eyelid may be incised and drained to diminish the risk of spread of infection, abscess formation, necrosis of overlying skin and development of excess scar tissue.

Periorbital edema:

Chemosis and edema following periorbital injury results from intravascular leakage into soft tissues. Edema will limit the ability to palpate the underlying facial bone fractures. When eyelid and edema interferes with globe examination the lids may be gently pried apart under topical anesthesia with the aid of two Desmarre’s retractor.

Orbital hemorrhage:

Blood distribution may be diffuse or localised to highly confined space within the subperiosteal, extraconal, intraconal, tenon's and nerve sheath space.

Orbital hemorrhage may impinge upon the optic nerve, globe, choroidal and retinal circulation or orbital venous drainage. Aggressive intervention is warranted if there is optic nerve dysfunction, dangerous elevation of IOP or retinal/choroidal ischemia.

Orbital emphysema:

Orbital emphysema is harmless unless there is ball or one way valve effect that does not allow the air to leave the orbit. In this case the air pressure may built up and constrain blood flow causing optic nerve or retinal ischemia and blindness so called orbital compartmental syndrome.

If emphysema is causing visual loss, Marcus gunn pupil, central retinal arterial occlusion, emergent decompression is indicated.

ORBITAL FRACTURES:

Orbital floor fractures:

Direct fracture results from trauma to inferior orbital rim of enough force to directly fracture the relatively thick bones that make up the rim.

Blow out/ indirect fractures involve fractures of orbital floor with intact inferior orbital rim. These fractures typically develop as a result of blunt trauma with a nonpenetrating object such as fist or ball which results in sudden increase in intraorbital pressure. Indirect evidence of blow out are orbital emphysema, infraorbital paresthesia and restriction of globe motility in the vertical meridian. Direct overt signs of a blow out fractures include globe ptosis and acute enophthalmos from expansion of the bony orbit.

Indications for surgical intervention are diplopia in primary position and motility limitation that does not improve within few days, positive FDT, for large bony defects (at least 1.5 x 2 cm) with herniated tissue, gross enophthalmos. The best surgical results are obtained when early intervention takes place (within week) as delay causes fibrosis, making any operation more difficult.

FULL THICKNESS LID LACERATIONS:

Reconstruction of full thickness injuries is begun with repair of the eyelid margin starting with placement of vertical mattress sutures of 6 0 silk through lid margin and tarsus using gray line as a landmark and followed by suturing on either side of lash line (three suture eyelid margin closure). The suture ends are anchored to the skin to prevent them rubbing against the globe.

To prevent the development of an eyelid notch with wound healing, eyelid margin should demonstrate an everted appearance at this point. The tarsus and orbicularis vertical mattress sutures are generally supplemented by single interrupted sutures of 6 0 silk to further approximate the posterior lid margin(three layer closure).

If the wound is under tension that prevents meeting of the eyelid margin edges, a canthotomy and cantholysis will loosen the eyelid by 2-5mm without distorting the lateral canthus. Eyelid marginal sutures are generally removed approximately 2-3 weeks following surgical repair.

NEURO OPHTHALMIC TRAUMA

TRAUMATIC OPTIC NEUROPATHY

Can be classified into direct and indirect injuries.

Direct injuries are from penetration of the orbit by missiles of various types or bone fragments.

Indirect injuries are from transmitted forces at different levels of optic nerve. Anterior indirect injuries involves the intraocular segment and posterior indirect injuries involve the retrobulbar portion of the optic nerve

The intracanalicular part is fixed within bony canal. The nerve can be contused in fractures of the sphenoid or basal bones. With the development of high resolution CT, even small non displaced fractures can be delineated. Despite the advance in technology, the presence or absence of fracture of the canal has not been correlated with visual outcome.

Holographic studies have shown that forces transmitted from a blow to the frontal area are concentrated in and around the optic foramen. Pressure transmitted to the facial bones even without an impact is capable of damaging the optic nerve. The firm attachment of the dural sheath to the optic nerve is

believed to make the nerve particularly susceptible to acceleration or deceleration injuries at this junction. In addition the vascular supply to the intracanalicular nerve may be more subject to disruption from sheer injury or from compression when the nerve swells within the confines of the canal.

Guidelines for treatment:

If there is no contraindication to the use of systemic high dose steroids, patients may be treated with 1 mg/kg/D dexamethasone in divided doses for 3 days. Failure to improve dictates rapid taper and discontinuation of the medication. Patients who appear to improve can be switched to tapering dose of prednisolone. If patient relapses when corticosteroids are discontinued, surgical treatment should be considered.

Decompression of optic canal can be accomplished either by craniotomy or through the paranasal sinuses (transethmoidal sphenoidal decompression).

Extracranial Optic nerve Decompression meeting, Boston 1993, Steroid treatment protocol for traumatic optic neuropathy is methyl prednisolone, 30 mg/kg IV as soon as possible (<8hrs) followed by methylprednislone 5.4 mg/kg/hr IV in continuous infusion for 23 hours followed by methylprednisolone 250 mg IV every 6 hrs for 48 hrs followed by oral steroid taper (prednisolone) for 15 days.

Patients with bone fragments or compressive lesions will be decompressed.

The rationale of high dose steroids is based on The National Acute Spinal Cord Injury Study (NASICS II) that steroids can reduce edema and tissue damage resulting from ischemic and traumatic injuries. There are several mechanisms to explain the neuroprotective effect of steroids-

1. Inhibition of oxygen free radical- induced lipid peroxidation.

2. Prevention of posttraumatic ischemia.

3. Reversal of intracellular calcium accumulation.

4. Support of energy metabolism

5. Prevention of neurofilament degradation

6. Inhibition of membrane lipid hydrolysis.

In a study comparing dexamethasone and methylprednisolone, methylprednisolone group has had more rapid recovery than those treated with high doses of dexamethasone.

PUPILLARY DISORDERS FOLLOWING TRAUMA

Traumatic mydriasis:

Due to direct injury to the iris sphincter muscle.

To differentiate traumatic mydriasis from third nerve pupillary involvement, SLE may shows flare/cells, sphincter tears at the pupillary margin. Another observation is pupil not only lacks normal constriction to light but also does not dilate very well in the dark. Other signs of iris injury are transillumination defects and iridodialysis may be present.

PART II

Aim of this study

- To study the type and patterns of ocular injuries
- Analysis of mode of injury
- Complications on follow up (upto 1 ½ years)
- Visual prognosis after injury.

Methods and Materials:

Inclusion Criteria:

All pediatric patients (12 years and below) attending Regional Institute of Ophthalmology Egmore Chennai, OPD with History of ocular trauma on our admission days were randomly selected.

Study period:

This study was carried out for a period from Feb. 2005 to Sept. 2006. (1 ½ years).

Clinical evaluation:

Children (< 7 yrs) with open globe injuries were examined in table only after anesthesia. Whereas for > 7 yrs and cooperative children, they were examined with standard slit lamp/portable slit lamp.

Visual acuity was assessed. Fundus examination after dilatation was done for cooperative children.

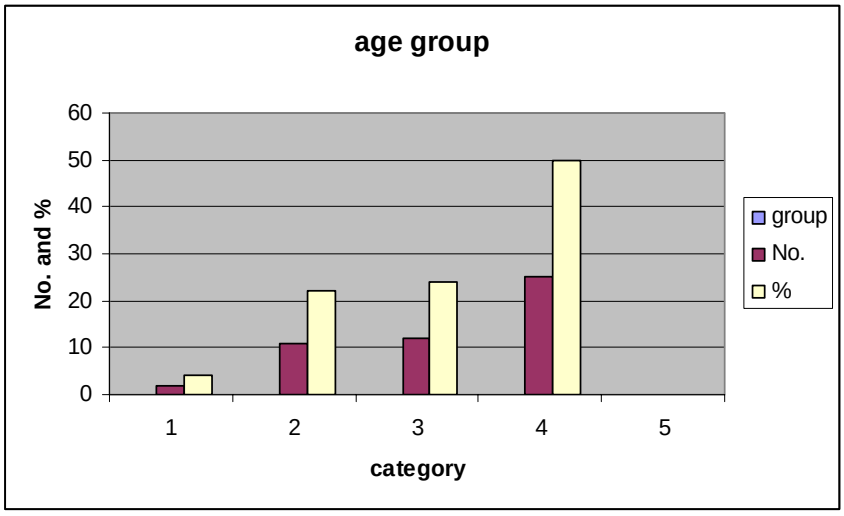
Type of injury, mode of injury, zone of injury were recorded. X- Rays, B- Scan, CT scan were done for appropriate patients.

Treatment and postoperative complications if any, were noted and are followed up to 1 ½ years at regular intervals. Complications if any, and repeat surgery if done, was noted.

ANALYSIS AND DISCUSSION

1. Age distribution:

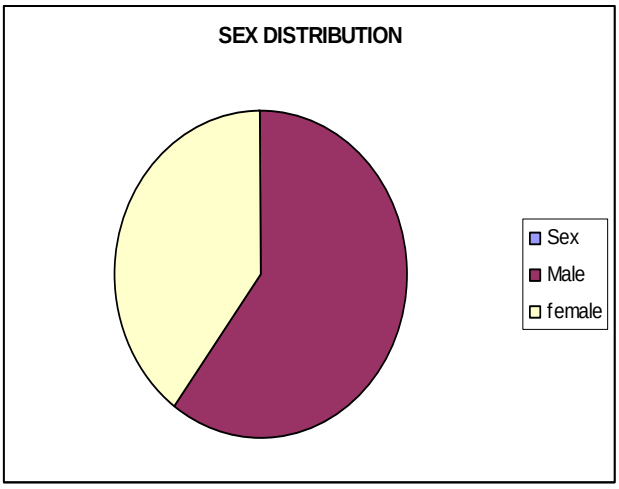
Age	Category	No.	%
< 2 yrs	I	2	4
3-5	II	11	22
6-8	III	12	24
9- 12	IV	25	50



Incidence of ocular trauma increases as age advances in children. This is because of their increase in outdoor activities and playing different unusual games among their friends. The incidence is less in children <2 yrs because they were always under the care of parents.

2. Sex distribution:

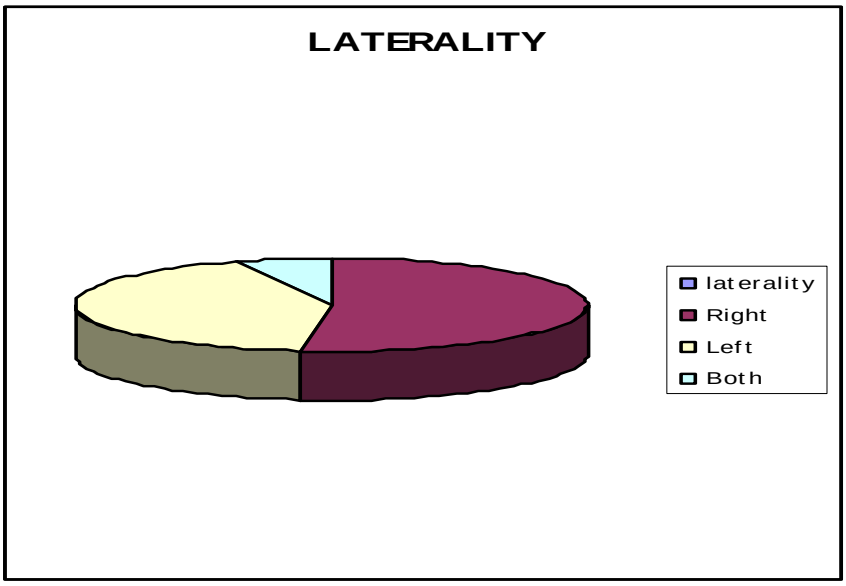
Sex	No.	%
Male	30	60
female	20	40



Increased incidence, seen in males indicates relatively more involvement in outdoor games, their aggressiveness and quarrel among their friends compared to female children.

3. Laterality:

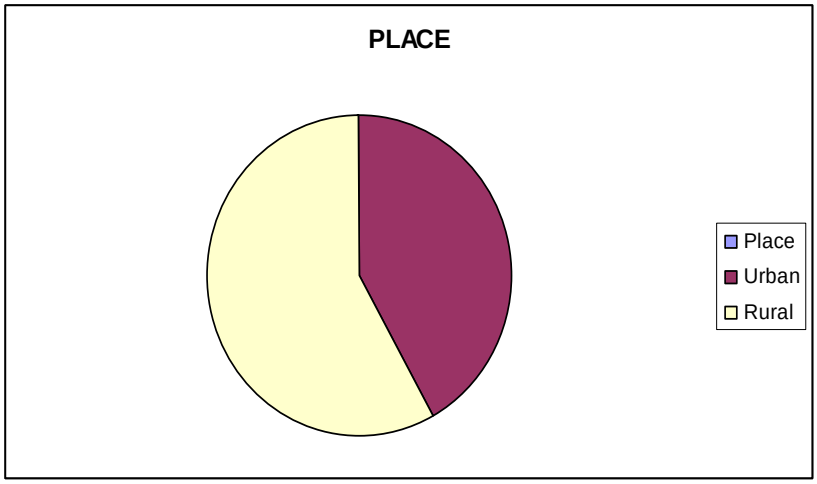
Laterality	No.	%
Right	26	52
Left	21	42
Both	3	6



In our study, right eye is involved more than left eye.

4. Place:

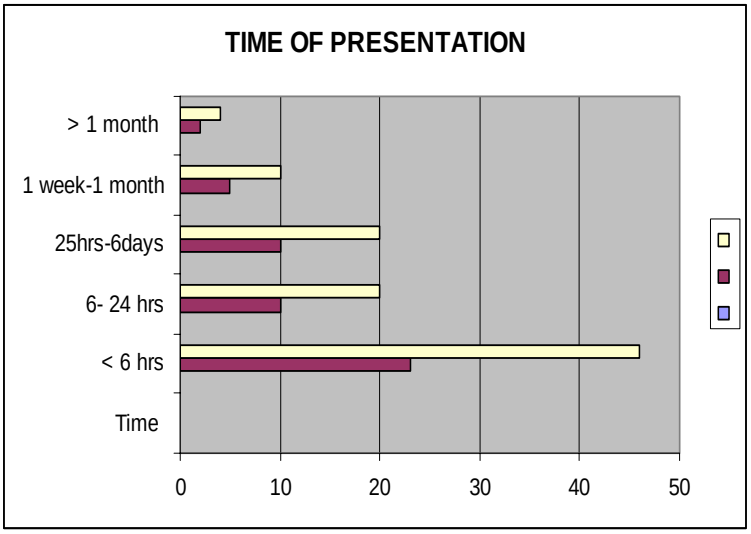
Place	No.	%
Urban	21	42
Rural	29	58



Rural pediatric population has more ocular trauma because of their peculiar type of games like playing fan with broom stick, mainly involving outdoor games, playing in streets hours together. Whereas, in urban areas children mainly involve indoor games(using ball, pen scissors). Even in urban areas injuries are more common in outskirts of city and slum areas.

5. Time of presentation:

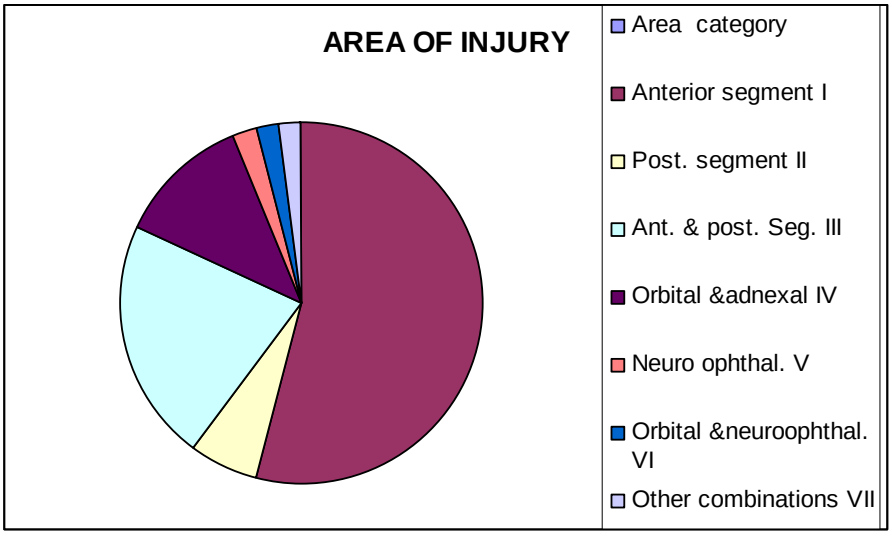
Time	category	No.	%
< 6 hrs	I	23	46
6- 24 hrs	II	10	20
25hrs-6days	III	10	20
1 week-1 month	IV	5	10
> 1 month	V	2	4



Most open globe injuries present to our hospital immediately (within 6 hrs) because of pain and sudden loss of vision. Whereas closed globe injuries report late. Neuroophthalmic trauma like traumatic optic neuropathy come in very late stage this being, due to lack of pain and vision loss not noticed until the other eye is occluded incidentally.

6. Area of injury:

Area	category	No.	%
Anterior segment	I	27	54
Post. segment	II	3	6
Ant. & post. Seg.	III	11	22
Orbital & adnexal	IV	6	12
Neuro ophthal.	V	1	2
Orbital &neuroophthal.	VI	1	2
Other combinations	VII	1	2



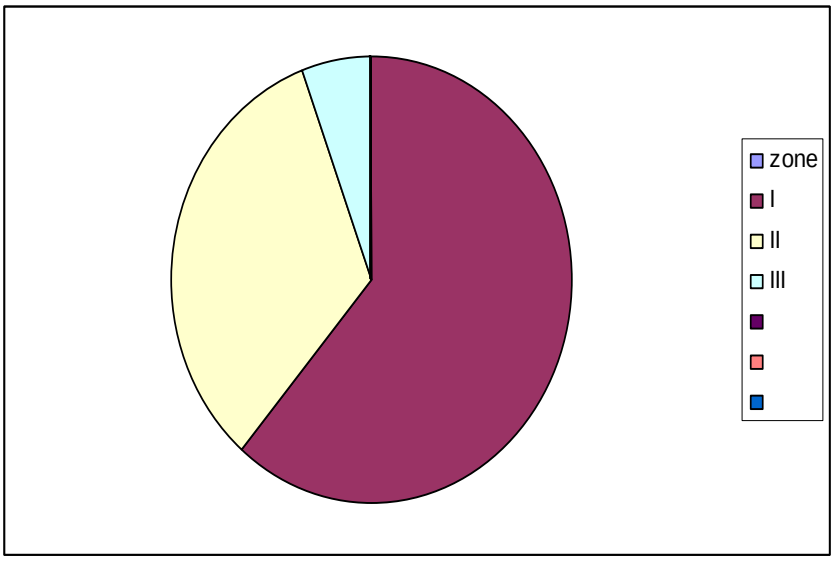
Here in our study **anterior segment trauma** seems common. This could be due to referral to government hospital since the prognosis of ocular trauma is poor when these areas are involved

7. **Type of injuries:**

Intra ocular injuries:

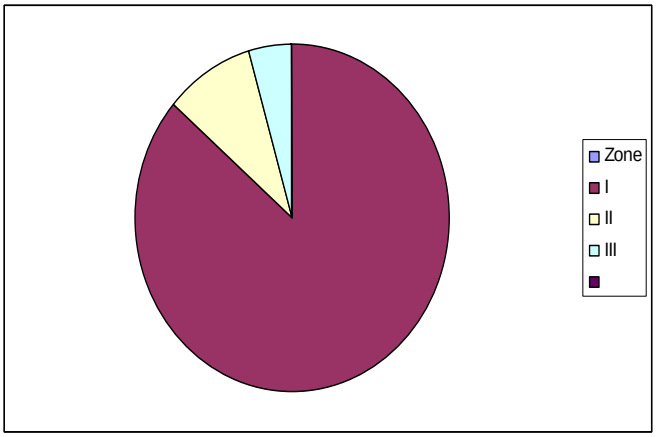
a. Closed globe injuries:

Zone	No.
I	11
II	6
III	1



b. Open globe injuries:

Zone	No.
I	19
II	2
III	1



In both closed and open globe injuries zone 1 was common. Zone 3 was found to less common. Both injuries are of same incidence.

In closed globe injuries, subconjunctival hemorrhage, lamellar corneal laceration and hyphema were common. Grade 1 & 2 hyphema resolves within first week. Most of the grade 3 & 4 hyphema had lens subluxation and cataract. In our study,we have not noted angle recession though we have attempted gonioscopy for many children with hyphema during follow up period.

In our study, Only one case of Retinal Detachment was noted who gave H/O trauma with ball 6 months before but this boy (though 11 yrs) never appreciated photopsia.

Of the open globe injuries, corneal laceration with or without uveal/vitreous prolapse was found to be more common.

Those eyes which had previous H/O of ocular surgery were more prone for serious involvement even with mild trauma. In our study, one case with H/O of Optical Keratoplasty, had evisceration after injury with door fence and cornea was found to be hanging.

8. Grade of injury:

Grade	**1**	**2**	**3**	**4**	**5**	**Could not be assessed**
Closed globe Injuries (no.)	5	2	6	5	1	1
Open globe injuries(no.)	-	-	2	11	6	3

At the time of presentation, it is very difficult to assess V/A in children due to pain and blepharospasm. Most open globe injuries present with grade 4 and 5 vision. Open globe injuries have better grade of vision (1-3) at time of presentation. Though much is said about assessing visual acuity in young children, practically it is very difficult to assess vision even with pictorial

charts which we used for this study. Illiteracy is a added contributory factor. In older children Snellen chart is used and they were very cooperative.

9. Mode of injury:

Injury with domestic objects appears to be common mode of injury. Injury happens when they run, hurry towards something, while playing, experimenting things etc.

Certain injuries peculiar to this age includes injury with broom stick, syringe needle, threading needle, thorn, pen refills and with ball.

In some cases (30%) the injured child is somewhere away and they are hit by ball, pen thrown from a distance. Though most children know that they are playing with sharp instruments, injuries occur unexpected eg. A child was playing with compus in sand while she was digging mud, when the mud fell into her eyes, her hands with compus poked her eye and complicated the injury. Seasonal injuries in child include cracker injuries and are common with eyelid burns.

Chemical injuries are less common if at all, it is due to splash somewhere in the face and parents come to check for eye involvement. RTA appears less common.

10. Foreign bodies in eye:

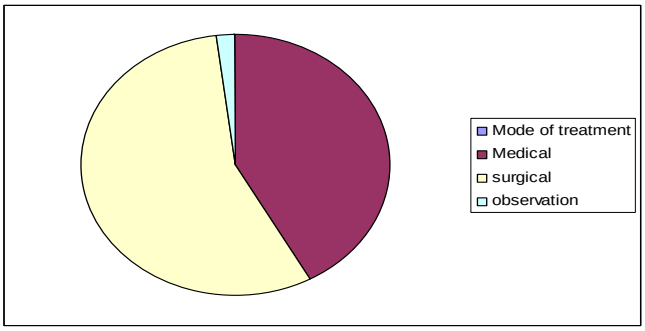
Extraocular foreign bodies (FB in cornea and conjunctiva) are less common than in adults and if found, is generally reported late, with organization, encapsulation, vascularisation with complaints of watering for months.

In our study one case of foreign body trapped in iris and another case of Fish hook injury was encountered.

Posterior segment foreign body which is common in adults was not seen even in single case of open globe injury in our study. (though a case of non metallic foreign body in cataractous lens was seen intraoperatively which was missed by X ray and B scan)

11. Treatment:

Mode of treatment	**No.**
Medical	21
surgical	28
observation	1



Most cases were managed surgically under GA. One case of traumatic subluxation reported to us with vision 6/12 and was planned to observe periodically.

During postoperative period, it was very difficult to open and examine the eyes of pediatric children managed with corneal suturing. Postoperative Uveitis was common and severe in many children with exudates and fibrin in anterior chamber.

Slit lamp examination also appears difficult.

Two cases of traumatic optic neuropathy managed with IV methylprednisolone did not show any improvement despite CT scan showing no evidence of fracture, only presenting later as optic atrophy.

12. Complications:

Traumatic cataract:

Is seen in 10 cases out of 42 intraocular injuries (22%)

Is common in most open globe injuries.

In most corneal lacerations where lens seems to be clear initially, develops cataract within first week. Though few cases were managed initially, most traumatic cataract were managed at a later date.

Visualization during surgery is hindered by corneal opacity.

Intraoperatively capsulorhexis was difficult and cortex was aspirated with Simcoe cannula.

The incidence of Postoperative uveitis was common and PCO starts to develop within first month. Decentred IOL was common probably due to unrecognized zonular weakness due to trauma. Those cases which do not come for regular follow up go for vision deprivation amblyopia.

PCO occurring is usually thick and requires surgical capsulotomy and management with YAG laser was not considered in too young patient.

Endophthalmitis:

Seen in 7 cases out of 21 open globe injuries (33%). Two cases presented with endophthalmitis whereas others went for this complication after surgery. Endophthalmitis complication after open globe injury is increased after injury with stick, presentation to the hospital after 6 hours, when there is vitreous prolapse along with corneal lacerations, and when injury occurs in very young age (< 4 yrs).

Postoperatively when this children are seen in the ward, it is very difficult to differentiate from postoperative uveitis and it progresses to endophthalmitis within 2-3 days.

12. **Visual prognosis:**

During follow up period of 1 ½ years, injuries limited to anterior segment generally had good prognosis compared to posterior segment trauma. Most corneal lacerations, even managed meticulously causes corneal opacity, astigmatism and decreased vision. Further vision is compromised by other complications as cataract etc. With vitreous involvement in open globe injuries, there is more incidence of endophthalmitis and visual prognosis is grave.

Neuroophthalmic trauma generally presents at later date in stage of optic atrophy. Most orbital and adnexal trauma had very good visual prognosis.

13. Repeat surgeries:

Out of 28 cases managed surgically initially, 7 cases underwent repeat surgery particularly for traumatic cataract and PCO(25%).

14. Others:

Batterered Baby syndrome, child abuse reported in western literature was not seen in our study.

Summary

50 children under the age of 12 were enrolled and they were followed up to 1 ½ years (Feb 2005- Sep.2006).

9-12 years (cat. IV) account for 50% of cases and ocular trauma was less in age less than 2 yrs.

Male children were more prone for injuries than female children (60%).

Both eyes are equally prone for injuries (RE- 52%)

58% of children are from rural population

46 % present to our hospital within 6 hours. 56 % come within 24 hours.

Injury with domestic objects (pen, ball, stick, needles etc) appear the common mode of injury. RTA and chemical injuries are rare.

Anterior segment trauma is more common (54%).

Closed globe injuries (38%) and open globe injuries(44%) are more or less of same incidence in our study group.

In closed globe injuries grade of injury is mostly 1-3. whereas in open globe it is 4-5.

IOFB is relatively rare than adult population

Most ocular injuries are treated surgically (56%)

Most common complications are cataract and endophthalmitis.

Traumatic cataract occurs in 22% of all intraocular injuries.

Endophthalmitis is seen in 33% of all open globe injuries.

Postoperative uveitis, Decentred IOL, PCO are the common postoperative complications

25 % children underwent repeat surgery.

Visual prognosis in anterior segment trauma is good than posterior or combined involvement.

CONCLUSION

Visual prognosis of ocular trauma depends on area of the involvement and time of presentation. More emphasis should be laid out on preventive measures by educating parents and children on ocular trauma and timely management.

PART III

Proforma for study on pediatric ocular trauma

Case No.:

1. Patient's data

Name: Age: Sex:

Address : Rural/Urban:

Mode of Injury:

2. On Examination

Vision:

Type of injury:

Grade of injury:

Zone of injury:

Presence or Absence of RAPD

3. Diagrammatic representation

Anterior segment findings:

Posterior segment findings:

Presence/absence of IOFB:

Extra ocular injuries:

4. Investigations

5. Treatment

6. Follow up

7. Complications

List of some surgeries done during my PG course

S.no.	Name	Age	Sex	Op/Ip no.	Diagnosis	Surgery
1	Sumathi	15	f	66113	Lower lid lacerations involving canaliculus	Lid suturing/ Teflon stent
2	Rani	49	f	62512	Pterygium	Excision / autograft
3	Pattu	70	f	398212	Rupture globe	Corneoscleral suturing
4	Annammal	60	f	48729	Chr. dacryocystitis	DCT
5	Durairaj	48	m	62147	Chr. dacryocystitis	DCR
6	Muniammal	56	f	399151	Panophthalmitis	Evisceration (frill excision)
7	Nagendran	59	m	397563	Mature cataract	ECCE/PCIOL
8	Munivel	65	m	397595	Mature cataract	ECCE/PCIOL
9	Christopher	53	m	421211	Immature cataract	SICS/PCIOL
10	Pitchammal	50	f	405592	Immature cataract	SICS/PCIOL
11	Kanimozhi	62	f	405510	Immature cataract	SICS/PCIOL
12	Karpagam	72	f	402182	Post op. endophthalmitis	Pars plana vitrectomy
13	Munner begum	61	f	399314	Absolute glaucoma	Trabeculectomy with PI
14	Subramani	45	m	381298	Subtotal corneal fungal ulcer	TKP
15	Nirmala	35	f	62523	Intrastromal foreign body	FB removal/ corneal suturing
16	Manikandan	23	m	411298	Alt. esotropia	RE: MR recession 6mm/ LR resection 8mm
17	Geetha	60	f	63457	Chalazion	Incision and curettage
18	Raghu	55	m	388791	Immature cataract	SICS/PCIOL
19	Kuppu	67	f	413264	Immature cataract	SICS/PCIOL
20	Ramasamy	61	m	409201	Immature cataract	SICS/PCIOL

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S.NO	NAME	AGE	SEX	U/R	LATERALITY	MODE OF INJURY	TYPE OF I	ZONE OF I	GRADE OF I	AREA OF I	TIME OF PRESE.	DIAGNOSIS	TREATMENT	COMPLICATIONS	FINAL V/A	IOFB
1	GUNASEKARAN	12	M	U	L	PEN	C		3	3	2 2 DAYS	CHOROIDAL RUPTURE	MEDICAL	CHR. MACULAR EDEMA	6 / 18	
2	RAMYA	4	F	R	R	THORN	O		1 NOT POSSIBLE		1 3 HOURS	CORNEAL LACERATION	SURGICAL	TRAUM. CATARACT	6 / 60	
3	MANIKANDAN	3	M	R	R	STICK	C		1 "		1 3 DAYS	LAMELLAR COR.LACER.	MEDICAL	CORNEAL OPACITY	6 / 36	
4	RAJI	10	M	R	L	STICK	O		1	4	3 1 HR	COR LAC./UVEAL/VITRE. PROLAP	SURGICAL	ENDOPHTHALMITIS	no PL	
5	SHANMUGHAM	10 M	M	R	R	NOT KNOWN	O		1 NOT POSSIBLE		3 > 1 WEEK	ENDOPHTHALMITIS	MEDICAL	PHTHISIS BULBI	no PL	
6	KANNAN	9	M	U	L	STICK	C		2	3	1 5 DAYS	TR. IRIDOCYLCITIS	MEDICAL	NIL	6 / 9	
7	SATHYA	12	M	R	R	RTA	E/C		3	5	6 6 HRS	BLOW OUT FRAC/TRA. OPTIC N	MEDICAL	OPTIC ATROPY	no PL	
8	KARPAGAM	10	F	R	L	FALL OF RAT	C		1	4	1 8 HRS	LAMELLAR COR.LACER.	SURGICAL	CORNEAL OPACITY	3 / 60	
9	ARUNKUMAR	9	M	R	L	STICK	E	NIL		1	4 2 HRS	LID LACERATIONS	SURGICAL	LID NOTCHING	6 / 6	
10	RAJALAKSHMI	7	F	U	R	BUS WINDOW	C		2	4	1 15 MIN	HYPHEMA/LENS SUBLUX.	SURGICAL	POSTOP UVEITIS/IOL DECENT	6 / 24	
11	KUMAR	11	M	R	R	THREAD NEEDLE	O		2	5	3 3 HRS	SCLER. LACER./TOT. HYP/VIT. HE	MEDICAL	CORNEAL BLOOD STAINING	no PL	
12	RAHEEK	9	M	U	L	BALL	C		3	4	2 3 WEEKS	FULL THICK. MACULAR HOLE	MEDICAL		3 / 60	
13	KRISHNAN	9	M	U	L	CYLCLE SPOKES	O		1	4	1 3 WEEKS	PEN. INJURY WITH TR. CAT	SURGICAL	SENSORY EXOTROPIA/PCO	6 / 60	
14	CHACHU	2	F	U	R	COMPUS	O		1 NOT POSSIBLE		1 30 MIN	PEN. INJURY WITH TR. CAT	SURGICAL	VISION DEP. AMBLYOPIA	Could not as	
15	ANITHA	12	F	U	R	STICK	O		1	4	1 3 HRS	COR LAC./UVEAL. PROLAPSE	SURGICAL		6 / 12	
16	MANIKANDAN	10	M	R	R	WINDOW FENCE	O		1	5	3 5 HRS	RUP GLOBE (PAST H/O OKP)	MEDICAL	PHTHISIS BULBI	no PL	
17	MUNIGOPINATH	4	M	R	R	PEN TIP	O		1	4	1 45 MIN	COR LACERATION/TRA. CAT,	SURGICAL	POSTOP UVEITIS.	6 / 60	
18	PARTHIBAN	4	M	R	L	SYRINGE NEEDLE	C		1	3	1 5 DAYS	POST TRAU. CORNEAL ULCER	MEDICAL	CORNEAL OPACITY	6 / 60	
19	SWARNAMEENA	7	F	R	L	RTA	O		1	4	3 6 HRS	COR LAC./UVEAL/VITRE. PROLAP	SURGICAL	ENDOPHTHALMITIS	no PL	
20	GAJALAKSHMI	12	F	R	R	FAN BLASÉ	C		2	4	1 24 HRS	TOT. HYPHEMA/ LENS SUBLUX	SURGICAL		1 / 60	
21	STEPHEN	12	M	U	B	CRACKER	E	NIL		1	4 2 HRS	LID BURNS	MEDICAL		6 / 9	
22	SURESH	10	M	U	L	PEN	O		1	4	3 5 HRS	COR. LACER/UVEAL PROLAPSE	SURGICAL	TR CATARACT	6 / 12	
23	SWETHA	3	F	U	R	BROOM STICK	O		1	4	3 5 DAYS	COR. LACER/UVEAL PROLAPSE	MEDICAL	ENDOPHTHALMITIS	no PL	
24	JAGAN	6	M	R	L	FALL FROM TREE	O		1	4	1 8 HRS	COR LACERATIONS	SURGICAL	TR CATARACT	6 / 12	
25	VELU	12	M	U	R	BROOM STICK	O		1	5	2 5 DAYS	ENDOPHTHALMITIS	MEDICAL	PHTHISIS BULBI	no PL	
26	JANAKI	7	F	R	R	NOT KNOWN	O		1	5	3 6 DAYS	COR LACERATION/UVEAL/VITREOUS PROL	SURGICAL	ENDOPHTHALMITIS	HM	
27	TAMILSELVAN	7	M	U	R	STICK	E	NIL		1	4 3 HRS	LID LACERATIONS	SURGICAL		6 /6	
28	NAGALAKSHMI	8	F	R	R	HAMMERING CHIS	O		1	4	1 6 WEEKS	PEN. INJURY / IRIS HOLE/TR. CAT	SURGICAL		6 / 18	
29	GOVINDARAJ	5	M	R	L	DOOR KNOB	C		2	2	1 2 DAYS	IRIDODIALYSIS/HYPHEMA	MEDICAL		6 / 18	
30	TAMILARASI	5	F	R	R	FINGER NAIL	C		1	1	1 8 HOURS	CONJ. TEAR	SURGICAL		6 / 6	
31	NATARAJ	12	M	R	L	MOLTEN METAL	C		1	1	1 2 HRS	THERMO-CHEMICAL INJURY GR2	MEDICAL		6 / 9	
32	NANDHINI	8	F	R	L	STONE	O		1	3	1 4 DAYS	ANTERIOR SEG FOREIGN BODY	SURGICAL		6 / 12	present
33	DASAYIAH	12	M	R	R	PLANT STUMP	C		1	4	1 6 DAYS	COR ULCER/DESCEMETACOELE	MEDICAL	PLAN FOR TKP	HM	
34	KUMAR	5	M	R	R	STONE	E	NIL		1	4 4 HRS	PERIORBITAL ECCHYMOSIS	MEDICAL	ORBITAL CELLULITIS	6 / 9	
35	NIVETHA	10	F	R	L	NEEDLE	O		1	4	1 6 DAYS	TR CATARACT	SURGICAL	VISION DEP. AMBLYOPIA	3 / 60	
36	SWAMINATHAN	9	M	R	L	BALL	C		3	4	2 6 MONTHS	CHR. RD	SURGICAL	SILICONE OIL GLAUCOMA	HM	
37	SELVI	9	F	U	L	WALL	O		3	5	3 8 HRS	RUPTURE GLOBE	SURGICAL	PHTHISIS BULBI	PL	
38	THIRUMALAI	5	M	U	L	BOTTLE	O		2	5	3 4 HRS	RUPTURE GLOBE	SURGICAL	ENDOPHTHALMITIS	PL	
39	BHARATHI	10	F	U	R	BOTTLE	C		1	1	1 2 HRS	SUB CONJ HE	MEDICAL		6 / 6	
40	ASIF	8	M	R	R	RTA	E			1	4 1 HR	LAT ORBITAL WALL FRACTURE	OBSERVATION		6 / 6	
41	RAMADASS	10	M	U	R	FALL/STAIRS	E	NIL		1	4 24 HRS	LID LACERATION/CANALICULUS	SURGICAL		6 / 6	
42	VIJAYALAKSHMI	6	F	R	R	NOT KNOWN	O		1	3	1 5 DAYS	PEN. INJURY/TR. CATARACT	SURGICAL	POST OP UVEITIS	6 / 24	
43	KALA	5	F	U	B	SPLASH PHENOL	C		1	3	1 2HRS	CHEM GRADE 1 INJURY	MEDICAL		6 / 6	
44	RAGHU	9	M	R	R	FALL TREE	E	NIL		4	5 3 WEEKS	TR. OPTIC NEUROPATHY	MEDICAL	OPTIC ATROPY	HM	
45	VISHAL	7	M	U	L	FALL OFINSECT	C		1	1	1 1 HR	FOREIGN BODY CORNEA	SURGICAL		6 / 6	
46	RAJESH	12	M	R	L	FISH HOOK	O		1	4	1 3 HRS	FISH HOOK ENTANGLED CORNEA	SURGICAL	TR CATARACT	6 / 18	present
47	VISALATCHI	8	F	R	R	BULL GHORE	C		2	5	3 5 HRS	HYPHEMA/LENS DISL/VITREOUS DISTR	SURGICAL		HM	
48	SHANMUGHA PRIYA	7	F	U	L	BALL	C		2	2	1 3 DAYS	TR SUBLUXATION	OBSERVATION		6 / 12	
49	KAMINI	5	F	U	R	NOT KNOWN	C		1	1	1 4 WEEKS	ORG. FOREIGN BODY	SURGICAL	CORNEAL OPACITY	6 / 6	
50	SAPTHAGIRI	10	M	U	B	CRACKER	C		1	3	7 2HRS	LID & CORNEAL BURNS	MEDICAL		6 / 6	